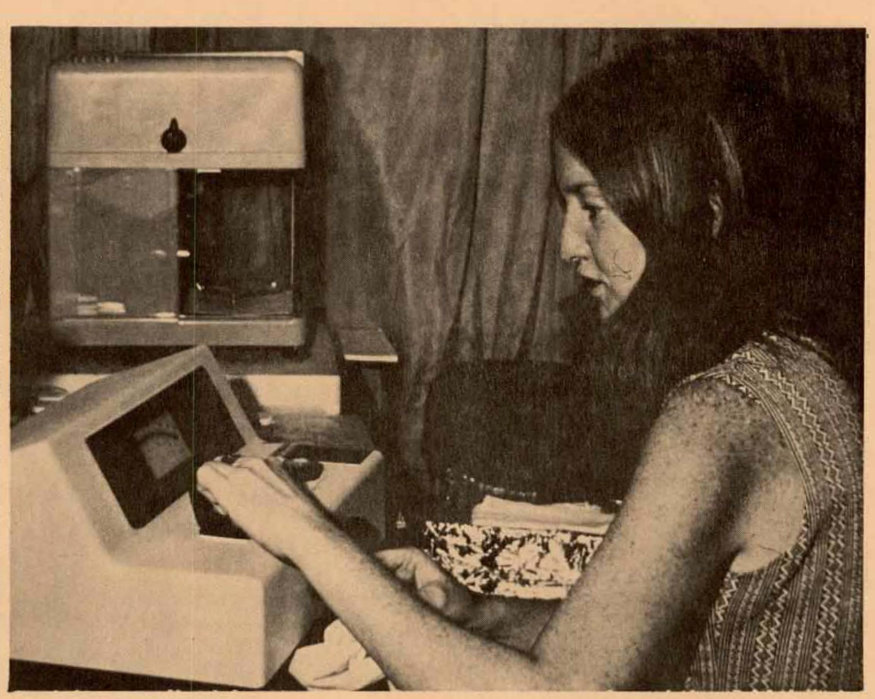
Forest INSECT & DISEASE CONDITIONS... 1976

in the Northern Region



FOREST INSECT AND DISEASE MANAGEMENT

State and Private Forestry

FOREST SERVICE • NORTHERN REGION

U.S. DEPARTMENT OF AGRICULTURE

Report No. 77-1

COVER PHOTO

Air pollution field evaluations use measurement of chlorophyll as an indicator of air pollution injury to forest ecosystems.

FOREST INSECT AND DISEASE CONDITIONS
1976

by

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and
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INSECT AND DISEASE CONDITIONS IN BRIEF

Spruce budworm continues to be a major pest in the Northern Region. In 1976, 3.2 million acres of defoliation were visible from the air. Egg mass surveys completed this fall indicate the infestation will continue at nearly the same level with some increase in 1977 on eastern Montana Forests. Pilot control tests on the Helena National Forest in June involved Dylox and Orthene. Larch casebearer populations have dropped dramatically. The only reports of extensive defoliation occurred near Bonners Ferry, Idaho. No reports of tussock moth defoliation were received in 1976.

Mountain pine beetle losses have increased in several areas. Major increases have been noted on the Gallatin, Kootenai, and Lolo National Forests and Glacier National Park. Portions of Yellowstone National Park have shown a decrease where the food supply is dwindling. Pine engraver beetle activity has decreased in Montana and Idaho. Fir engraver beetle also decreased; however, 11,000 acres are infested in Idaho. Douglas-fir beetle is at endemic levels with a few group killings in mature unlogged stands. Significant amounts of container-grown grand fir seedlings were killed by a species of *Fusarium*, and a *Botrytis* species caused loss of nearly 1,300 container-grown ponderosa pine. Frost heaving resulted in considerable damage to 1-0 Douglas-fir seedlings at the Regional nursery. *Lophodermella concolor* defoliated lodgepole pine in western Montana and northern Idaho. *Elytroderma* needle cast continued to reinfect ponderosa pine in western Montana. Root disease centers 20 to 30 acres in size were detected on the Lewis and Clark National Forest in eastern Montana with *Armillaria mellea* identified as the causal agent. Large *Armillaria* centers also have been detected in western Montana, and management alternatives for these areas are now being explored. An expanded survey of *Poria weirii* root disease centers in northern Idaho and western Montana is in progress. Stem decays and their relationship to hazard trees in Yellowstone Park are being evaluated.

Damage by air pollutants to forest resources is continuing. Two new 350-megawatt coal-fired electric power plants went on-line this year in eastern Montana, and SO_2 and NO_x emissions may damage nearby pure stands of ponderosa pine. Hydrogen fluoride from an aluminum plant in northwestern Montana caused widespread injury to most vegetation within 5 miles of the smelter. Injury and damage to trees from a large copper smelter at Anaconda, Montana, continued and acidification of soils was evident over a large area. Collectively, nearly 1 million acres of forested lands of various ownerships in the Region sustained varying amounts of pollutant-caused damage.

Dwarf mistletoe control was done on 2,144 acres. Dutch elm disease was identified on the University of Montana campus at Missoula, Montana.

STATUS OF INSECTS

Major Defoliators

Douglas-fir Tussock Moth, *Orgyia pseudotsugata* McD.

No significant Douglas-fir tussock moth defoliation occurred in Region 1 in 1976. Montana State entomologists cooperated with the accelerated tussock moth project by surveying several areas in Montana for newly hatched larvae in spring of 1976. Surveys were conducted in areas where large numbers of male adults were pheromone-trapped last fall. The purpose of the study was to measure correlations between pheromone trappings and larvae numbers.

Applications of Orthene, Sevin wettable powder, Dimilin, and Pyrocide Growers Spray were tested as ground sprays on individual trees by the State of Montana. All materials provided excellent control.

Western Spruce Budworm, *Choristoneura occidentalis*, Freeman

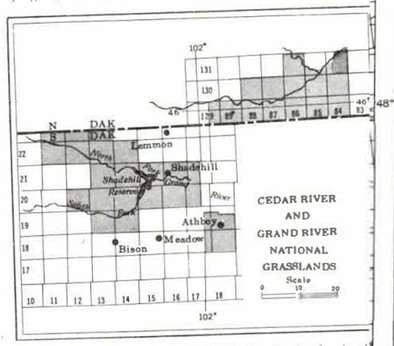
Visible defoliation extended over 3,266,557 acres in Montana and Idaho and portions of Wyoming in Yellowstone National Park (Figure 1). Budworm defoliation was quite severe in the Gallatin Canyon this year where it was conspicuous to the general public. A draft environmental statement dealing with the alternatives of spruce budworm management was in preparation at the end of the year. Table 1 shows amount and changes in defoliation on 10 National Forests, Yellowstone National Park, and Flathead Indian Reservation.

Pilot control tests of Dylox and Orthene were conducted on the Helena National Forest in June-July 1976. Dylox was applied 1 pound of active ingredient in one-half gallon of HI SOL 4-5-T per acre. Orthene (80 percent active) was formulated at 1.33 pounds in 0.885 gallon of water and applied at 1 gallon per acre. Both insecticides contained Automate Red "B" dye. Dylox killed 59 percent of the population and Orthene 86 percent. These values reflect corrections for natural mortality.

Egg mass surveys last fall indicate defoliation will be heavy on portions of the Beaverhead, Bitterroot, Deerlodge, Helena, Gallatin, Lewis and Clark, and Lolo National Forests and surrounding private lands. Moderate defoliation is expected on a portion of the St. Joe and Kootenai National Forests and light defoliation on the Nezperce, Clearwater, and Flathead National Forests. Heavy defoliation is predicted for portions of the Flathead Indian Reservation.

WESTERN SPRUCE BUDWORM INFESTATIONS

1976



LEGEND

- Regional Headquarters Missoula, Montana
- Forest Supervisors Headquarters
- National Forest Areas in Region One

US DEPARTMENT OF AGRICULTURE
FOREST SERVICE
JOHN R. McGUIRE, CHIEF

NATIONAL FORESTS
REGION ONE

1975

Scale
20 10 0 20 40 Miles

Prepared at Regional Office, Missoula, Mont
Revised September, 1962

Table 1.--Acres of aerially visible[1/] western spruce budworm defoliation in the Northern Region from 1975 to 1976

Unit[2/]	Acres of visible defoliation 1975	1976	Increase or decrease in size of infestation (Acres)
Idaho			
Clearwater National Forest	634,830	358,070	-276,760
Idaho Panhandle National Forest	189,617	190,591	+ 974
Nezperce National Forest	7,040[3/]	107,050	+100,010
Subtotal	831,487	655,711	-175,776
Montana			
Beaverhead National Forest	240,990	250,427	+ 9,437
Bitterroot National Forest[4/]	402,504	413,641	+ 11,137
Custer National Forest	0	5,155	+ 5,155
Deerlodge National Forest	271,629	223,666	- 47,963
Flathead Indian Reservation	105,705	68,156	- 37,549
Flathead National Forest	111,219	99,801	- 11,418
Gallatin National Forest	337,929	286,325	- 51,604
Helena National Forest	473,937	313,161	-160,776
Kootenai National Forest	3,606	9,685	+ 6,079
Lewis and Clark National Forest	7,367	5,927	- 1,440
Lolo National Forest	843,100	820,330	- 22,770
Subtotal	2,797,986	2,496,274	-301,712
Wyoming			
Yellowstone National Park	111,972	114,572	+ 2,600
Grand Total	3,741,445	3,266,557	-474,888

1/ Aerially visible defoliation occurs when 25 percent or more of the current foliage is consumed.

2/ Infested acreage on National Forest maps includes all Federal, State, and private lands.

3/ Entire Nezperce National Forest was not surveyed for budworm defoliation in 1975.

4/ A portion of the Bitterroot National Forest is in northern Idaho.

Larch Casebearer, *Coleophora laricella* (Hbn.)

Populations of larch casebearer declined dramatically in 1976. The only extensive areas of defoliation occurred near Bonners Ferry, Idaho. Stands of green larch are visible in Region 1 for the first time in several years. Parasite releases have continued, and *Chrysocharis laricinellae* (Ratz) has been recovered for the first time near Evaro, Montana, where it was released 3 years ago.

Bark Beetles

Mountain Pine Beetle, *Dendroctonus ponderosa* Hopk.

Acres of epidemic mountain pine beetle infestation in lodgepole pine increased dramatically in Montana in 1976. Most severe infestations occurred in Jack Creek drainage, Beaverhead National Forest; Gallatin Canyon and Yellowstone Flats, Gallatin National Forest; Thompson River, Lolo National Forest; Yaak River drainage, Kootenai National Forest; and a massive increase in infested acreage developed on the west side of Glacier National Park (Figure 2).

Approximately 3,700 acres of lodgepole pine are infested in the North Fork drainage on the Flathead National Forest and adjacent Glacier National Park. In Yellowstone National Park, Wyoming, the infestation declined in the southwestern portion of the Park, where epidemic conditions have persisted for about 9 years. New outbreaks developed near Dennis Mountain, Salmon River Breaks Primitive Area, Bitterroot National Forest, Idaho, and an epidemic infestation persists in Lincoln Gulch, Helena National Forest, Montana.

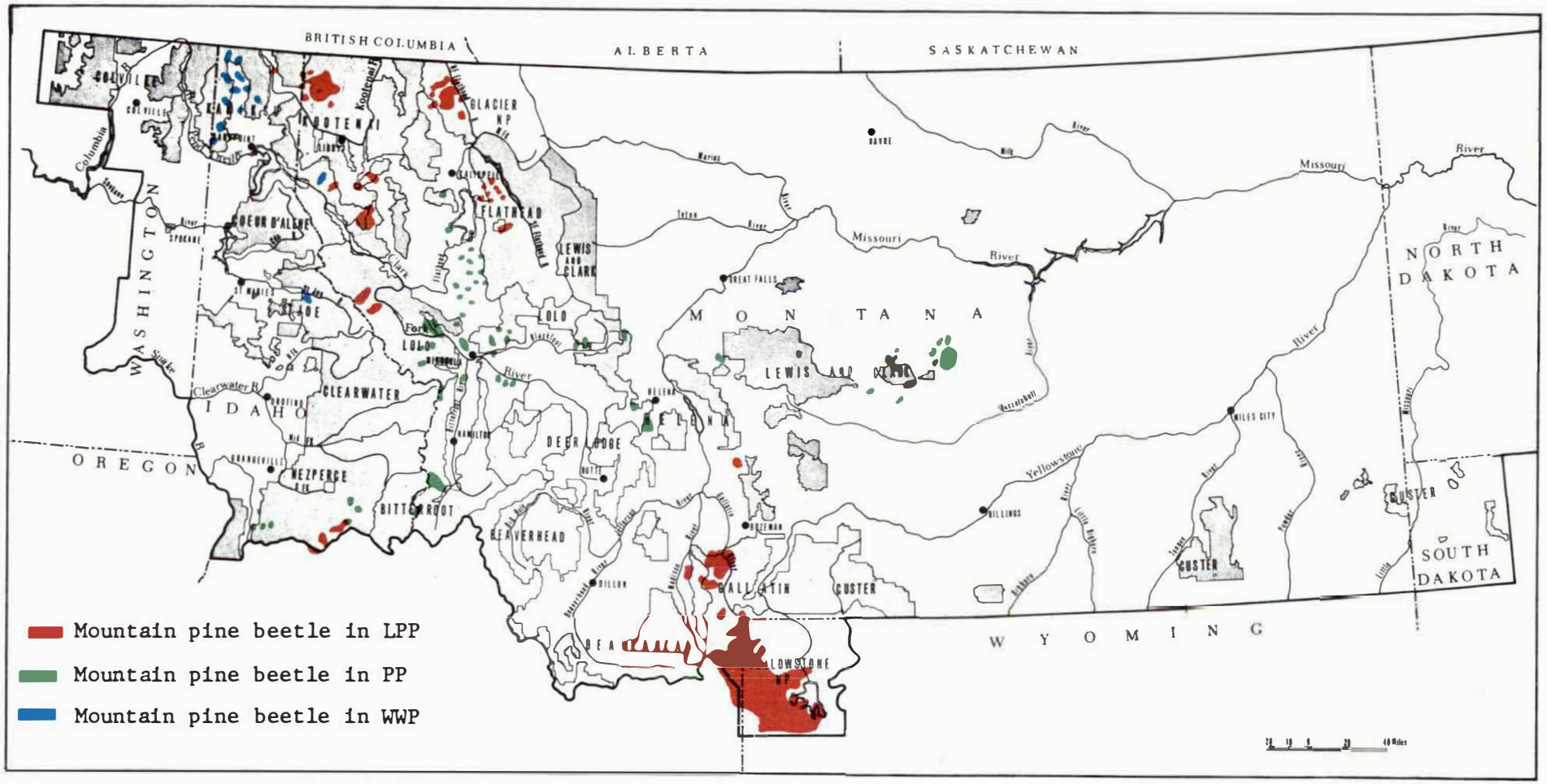
Mountain pine beetle populations increased in second-growth ponderosa pine stands in the Clark Fork River drainage near Missoula, Montana, and on State and private lands in the Blackfoot River drainage from Diamond Mountain east to Clearwater-Blackfoot River junction. Light infestation of groups of 1 to 20 trees occurred in the Garnet Mountain Range from Bonner east to Gold Creek, Montana. Mortality increased on Federal, State, and private lands in the Belt Mountains, Lewis and Clark National Forest, southeast of Great Falls, Montana. Epidemic infestation continued for a third year on the northwest side of Shook Mountain and small 10-tree group kills were detected up the West Fork Bitterroot River drainage, Bitterroot National Forest, Montana. Infestation continues in mixed lodgepole-ponderosa pine stands on State, private, and Federal lands near St. Regis, Montana.

Beetle-caused mortality in western white pine is at a low level.

Fir Engraver Beetle, *Scolytus ventralis* LeC.

Infestations in grand fir stands decreased on the Clearwater, Idaho Panhandle, Nezperce, and St. Joe National Forests, Idaho. Approximately 11,000 acres contain epidemic infestation. New outbreaks developed on the Stillwater and Swan State Forests north of Seeley Lake, Montana.

Figure 2.--Areas of mountain pine beetle infestation, Northern Region, 1976



Western Balsam Bark Beetle, *Dryocoetes confusus* Sw.

Mortality of subalpine fir increased significantly in most Forests in the Region. New outbreaks developed in the Beaverhead, Bitterroot, Custer, Deerlodge, Gallatin, and Helena National Forests, Montana. Tree mortality increased in older infestations of the Flathead, Lewis and Clark, and Lolo National Forests, Montana. Infestations on the Clearwater, Idaho Panhandle, and Nezperce National Forests, Idaho, and the Kootenai National Forest, Montana, declined to low levels.

Pine Engraver Beetle, *Ips* spp.

Three years of consecutively moist climatic conditions and good forest management have maintained pine engraver beetle populations at an endemic level.

Other Insects

Pine Needle Sheath Miner, *Zelleria haimbachi* (Busck)

Defoliation caused by the needle sheath miner in the Flathead area of Montana has subsided and was not visible from the air in 1976.

Douglas-fir Needle Midge, *Contarinia pseudotsugae* Condrashoff

The Douglas-fir needle midge was heavy on the Seeley Lake District, Lolo National Forest, Montana, and along the Blackfoot River.

Pine Needle Scale, *Chionaspis pinifoliae* (Fitch)

A very heavy infestation of pine needle scale on lodgepole pine within the city limits of Seeley Lake, Montana, has occurred. Evidently it has been there a few years.

Larch Looper, *Semiothisa sexmaculata* (Pack)

About 2,000 acres of larch looper-caused defoliation occur in western larch stands near Thompson Falls, Montana. Pupae were discovered in the duff under defoliated larch. Historically larch looper outbreaks last about 2 years and are not considered a serious pest problem in Region 1.

Satin Moth, *Stilpnotia salicis* (L.)

About 2,000 acres of defoliation of cottonwood occurred on the Coeur d'Alene River area and along the St. Joe River drainage in Idaho.

Suspected Insect Damage to Western Larch Seedlings

Many 1-0 western larch seedlings at the Coeur d'Alene Nursery, Idaho, were damaged at groundline by an unknown insect. Even though wounds had callused over, a large number of seedlings were culled. The damage agent has not been identified, but cutworms are suspected to be involved.

STATUS OF DISEASES

Nursery Diseases

A variety of disease problems were observed on container-grown seedlings in the Coeur d'Alene Nursery. A species of *Fusarium* (tentatively identified as *F. roseum* Lk. ex Fr. emend. Snyd. & Hans.) caused mortality in grand fir seedlings involved in the Region's Tree Improvement Program. Lesions which eventually girdled the succulent stems were formed at ground line, and were often accompanied by salmon-pink spore masses. *Botrytis* sp. (probably *B. cinerea* Pers. ex Fr.) was responsible for the loss of some 1,300 ponderosa pine seedlings. Excessively high humidity and cool temperatures during hardening-off of seedlings contributed to disease expression (Figure 3).

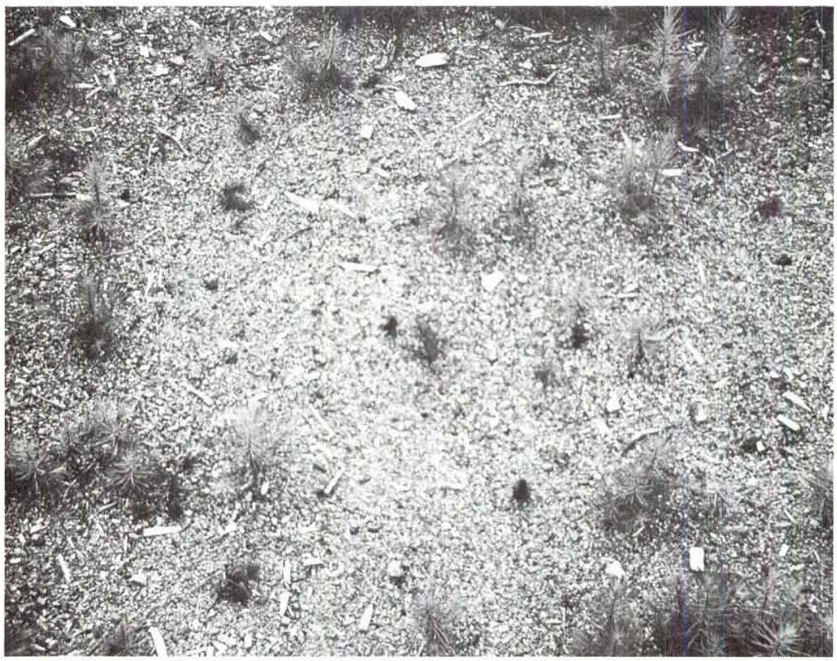


Figure 3.--Nursery diseases cause mortality in seedlings, leaving large, nonproductive spaces in seedbeds.

Minor damage was observed in nursery bed seedlings. Frost heaving was responsible for the loss of 1-0 Douglas-fir seedlings. Root rot was infrequently observed in all species and age classes of seedlings. Cool temperatures during the growing season which are unfavorable for development of *Fusarium* root disease were apparently effective in reducing losses. An unidentified agent causing defoliation and cankers was noted in 1-0 western larch. In early spring, needles appeared bleached and soon died. Eventually, sunken necrotic lesions (cankers) of varying severity were noted on stems around nodes. Some stems were completely girdled and tops collapsed, while other stems were only partially girdled. Known pathogens were not isolated from cankers or foliage, but damage appears somewhat similar to that reportedly caused by *B. cinerea* on nursery stock.

Needle Diseases

Pine needle cast fungus, *Lophodermella concolor* (Dearn.) Darker, caused significant defoliation of lodgepole pine in the lower Clark Fork River drainage in Montana for the second successive year. In addition, severe infection was observed as far south as Lewiston, Idaho, and eastward into western Montana. In one case, fast-growing lodgepole pine being cultured as Christmas trees and nearing harvest age were damaged beyond use.

Elytroderma deformans (Weir) Darker causing "Ely witches brooms" continued to reinfect ponderosa and lodgepole pines in western Montana.

Douglas-fir needle cast, caused by *Rhabdocline pseudotsugae* Syd. and a needle rust fungus, *Pucciniastrum goeppertianum* (Kuehn) Kleb., were infrequently observed in western Montana and northern Idaho on Douglas-fir and true firs respectively.

Root Diseases

Root disease centers up to 20-30 acres in size were identified on the Lewis and Clark National Forest. Shoestring root rot fungus, *Armillaria mellea* (Vahl ex Fr.) Kumm., was isolated from dead and dying conifers and is considered to be the causal agent. These centers are spectacular in that margins with dead and dying conifers are abrupt and interior portions have been well restocked with a variety of conifer species which are now being infected and are dying. During a limited survey of the Logging Creek and upper Smith River area on the Lewis and Clark National Forest, some 300-400 acres were found to be involved (Figure 4).

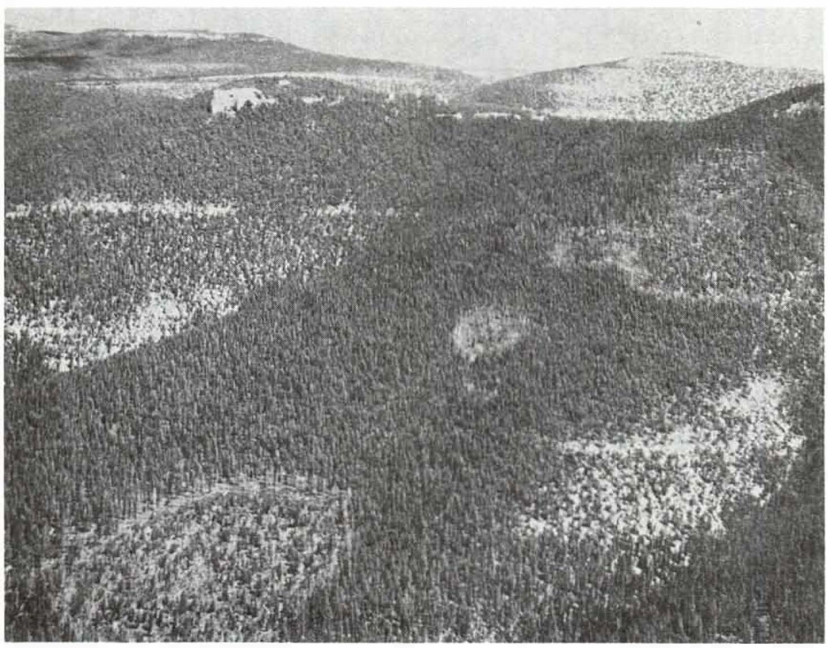


Figure 4.--Armillaria root disease centers, evident by circular patterns of dead and down timber, cause significant damage to coniferous forests on the Lewis and Clark National Forest in eastern Montana.

Root disease centers also apparently caused by *A. mellea* are being identified with increasing frequency in western Montana. Variously sized infection centers have been identified along the west side of the Mission Range on Bureau of Indian Affairs forests; in the Lincoln-Ovando area on Champion International lands; along the southwest slopes of the Swan Range on the Seeley Lake Ranger District, Lolo National Forest; and in the DeBorgia area on the Superior Ranger District, Lolo National Forest. Major host species affected are Douglas-fir, grand fir, subalpine fir, and Engelmann spruce. Evaluations of various management strategies for these disease centers are being done.

An expanded survey of root disease centers involving laminated root rot fungus, *Poria weirii* (Murr.) Murr. (*Phellinus weirii* (Murr.) Gilbertson), in northern Idaho and western Montana is currently underway. Data collected will supplement that obtained during the original root disease survey on the Coeur d'Alene National Forest in which 5.1 percent of the commercial forest acreage was estimated lost to root disease centers.

An evaluation to determine quantity of airborne inoculum (spores) of annosus root rot fungus, *Fomes annosus* (Fr.) Cke., was begun this spring. Inoculum has been found during most months from all three areas where evaluations are being conducted.

Stem Decay

A survey of major campgrounds and picnic areas in Yellowstone National Park was made to evaluate the hazard tree situation. Major potential hazards were standing and leaning dead trees, and standing green trees with butt rot extending into the roots. The latter were nearly always associated with old wounds at ground line. Significant numbers of potential hazard trees were present in all high use areas with old-growth lodgepole pine, Engelmann spruce, or subalpine fir.

Stem Rusts

White pine blister rust, *Cronartium ribicola* J. C. Fischer, is continuing to infect and kill all age classes of western white pine in western Montana and northern Idaho.

Air Pollutants

Two 350-megawatt coal-fired electric generating plants went on-line in eastern Montana during 1976 (Figure 5). It is estimated that annually 58,000 tons of sulfur dioxide (SO_2), 56,000 tons of nitrogen oxides (NO_x), 19 tons of fluoride (F), and 5,000 tons of particulate will be discharged collectively from these two facilities and two 700-megawatt plants planned for the near future. It is probable that these emissions will cause injury to extensive pure stands of ponderosa pine on State, private, and National Forest lands downwind of the steam plants. For this reason, an in-depth evaluation to characterize the ponderosa pine system prior to operation of the plants was initiated in 1975. Estimates of needle

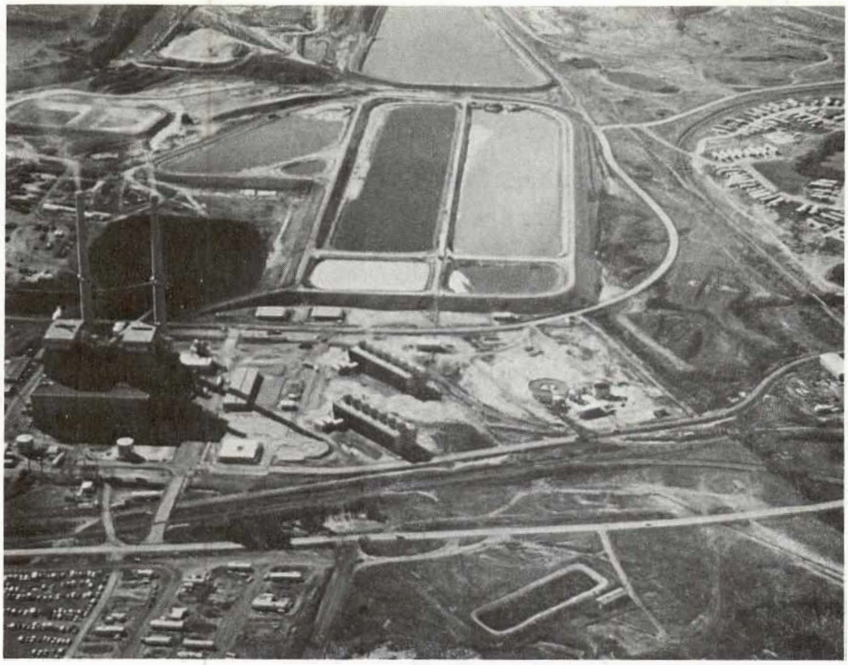


Figure 5.--Coal-fired steam electric generating stations in easterm Montana inject phytotoxic sulfur oxides and fluorides in the atmosphere.

retention, needle pathology, needle length, fascicular cross-sectional area, moisture percentage, total sulfur and fluoride, and total chlorophyll were made on needles collected from 16 permanent plots. Also, current airborne concentrations of SO_2 and F were measured. It is anticipated that future pollutant effects, if any, will be readily discernible by repeating the evaluation at future dates (Figure 6).

Figure 6.--Quantitative analyses of various characteristics of ponderosa pine collected in the vicinity of sulfur oxide emitting coal-fired steam plants provides valuable baseline data concerning forest ecosystems that may be damaged by air pollutants.

Hydrogen fluoride from an aluminum plant at Columbia Falls, Montana, caused continued widespread injury and damage to Douglas-fir, lodgepole pine, ponderosa pine, western larch, and many associated browse and forage species. Injury was detected on nearly 20,000 acres of State, private, and Federal lands.

Continuing air pollution injury and damage to forest trees from primary metal smelters, aluminum plants, and pulp mills is evident on nearly 1 million acres of forested lands of all ownerships in the Northern Region, resulting in significant impact on timber growth, recreational and wildlife resources.

Dwarf Mistletoe

Silvicultural control of dwarf mistletoe was accomplished on 2,144 acres on the Beaverhead National Forest, Montana, in conjunction with normal timber management activities. All financing was from timber funds.

LPMREV, a simulated yield computer program, is now ready for use as a decisionmaking tool in the management of dwarf mistletoe-infested lodgepole pine stands.

Urban and Community Forestry

A survey of urban tree conditions was conducted in Great Falls, Montana. Most of the trees were in relatively poor condition as a result of the drier-than-normal summer of 1973; nearly all American elm exhibited top dieback. These dead tops would be excellent breeding spots for the smaller European elm bark beetle (*Scolytus multistriatus*), the vector of Dutch elm disease (caused by *Ceratocystis ulmi* (Buism.) C. Moreau). Neither the beetle nor the fungus has yet been found in Great Falls.

There were 10 American elm with confirmed Dutch elm disease in Missoula, Montana. Four of these were on the University of Montana campus; the remainder were scattered throughout the city. The number of diseased trees is expected to increase next year.

DETECTION SURVEYS

Detection is a key element in the management of forest pests. Forest Insect and Disease Management depends on the assistance of land managers of all agencies to alert them to the activity of pests. One detection system is sending in Forest Pest Detection Field Reports (Form 5200-1) (Figure 7) and specimens of the causal agent or damage to:

USDA - Forest Service
Forest Insect and Disease Management
Federal Building
Missoula, Montana 59807

Form Approved
OMB No. 40-R2844.1

FOREST PEST DETECTION FIELD REPORT

1. Date ____, ____, ____.
2. Location: T____ R____ S____
3. Tree species:
4. Symptoms: Yellowing - Wilting - Reddening - Stunting - Defoliation - Brooming - Canker - Callus - Flagging - Girdling - Resinosis - Dieback - Dying - Dead top - Dead - Boring - Chewing - Gnawing - Webbing - Frass - Conks - _____ (Other).
5. Part of tree damaged: Roots - Bole - Leader - Branches - Twigs - Buds - Foliage - Flowers - Fruits.
6. Age and size of trees affected: _____
7. Single trees ☐, or groups ☐, per group) (No. Affected) ____.
8. Acreage affected _____ trees/acre _____.
9. Contributing factors:
10. How long has situation existed: _____.
11. Status: Increasing ☐, decreasing ☐, constant ☐.
12. Your own diagnosis:
13. Is control being conducted? Yes ☐ No ☐
    If no, is it being planned? Yes ☐ No ☐
14. Other information and remarks:

Name and Address of Reporter _____

USDA—Forest Service 5200-1 (9/72)

Instructions for Completing Field Report

1. Month, day, year, insect, disease, or animal damage noted.
2. Legal subdivision (T,R,S) or other precise description.
3. Either common or botanical name.
4. Encircle the item or items best describing this abnormal condition.
5. Encircle the pertinent item or items.
6. Classify as to reproduction, saplings, poles, young, sawtimber, or old-growth. Seedling or sprout? Planted or natural?
7. Put an x or number in the appropriate space.
8. Estimate total area affected and average number of affected trees per acre.
9. Note such contributing factors as: Fire, Logging, Grazing, Construction, Blowdown, Lightning, Flood, Drought, Snow, Ice, or Frost damage.
10. Your estimate of how long this abnormal condition has existed.
11. Place a check to show present status.
12. State what you consider to be the cause of the trouble.
13. Check yes or no.
14. Add whatever you think might aid in diagnosing and appraising the situation, including a sketch of location of affected area.

SEND SPECIMENS TO THIS SAME ADDRESS

GPO 934-910

Figure 7.--Form 5200-1

During 1976, 67 detection reports were received by Forest Insect and Disease Management. Filling out Form 5200-1 is self-explanatory, but some insect and disease specimens arrived in poor condition. Most insects can be shipped in vials of alcohol inside cardboard boxes. Damaged parts of trees should be placed in plastic bags and kept cool until boxed for shipping.

Aerial surveys to detect forest insect, disease, animal, and weather damage were made on 32.3 million acres of forested land in the Northern Region during 1976. The States of Idaho and Montana copperate in making these annual surveys. Acres flown by ownership are tabulated below:

State	Ownership	Acres surveyed (millions)
Montana	National Forest	13.4
	Bureau of Land Management	.8
	Glacier National Park	.4
	Indian	.8
	State and private	5.1
	Subtotal	20.5
Northern Idaho	National Forest	6.6
	Bureau of Land Management	.2
	Indian	.1
	State and private	3.1
	Subtotal	10.1
Wyoming	Yellowstone National Park	1.8
	Total	32.3

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